

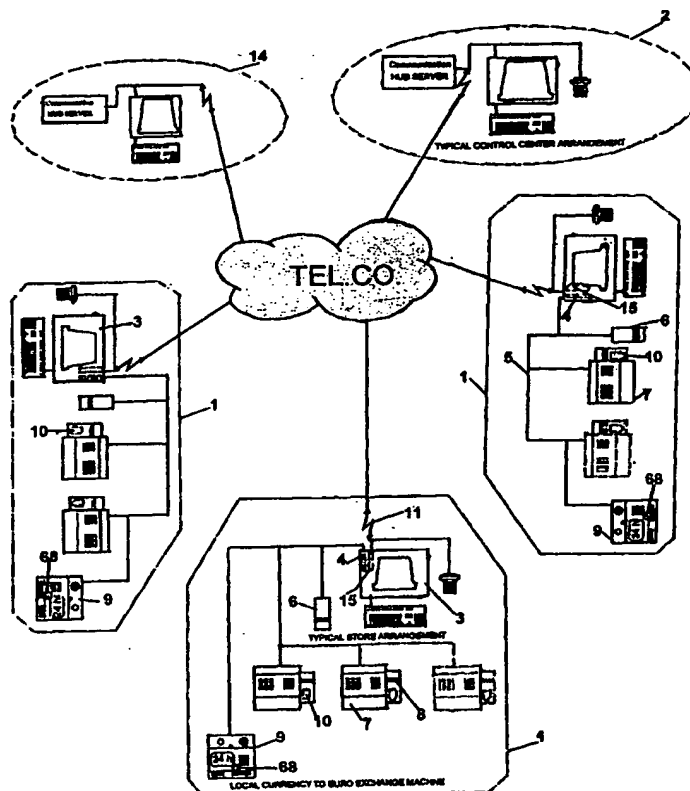


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : G07D 7/00	A1	(11) International Publication Number: WO 00/05688 (43) International Publication Date: 3 February 2000 (03.02.00)
(21) International Application Number: PCT/GR99/00026 (22) International Filing Date: 20 July 1999 (20.07.99) (30) Priority Data: 980100290 22 July 1998 (22.07.98) GR (71)(72) Applicant and Inventor: PARASKEVAKOS, Theodore-George [US/GR]; 91 Aspasia Street, GR-155 61 Holargos Attikis (GR).		(81) Designated States: AU, CA, IL, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: INTELLIGENT CURRENCY VALIDATION NETWORK**(57) Abstract**

The object of this invention is to establish a method for an intelligent identification system to recognize and validate currency base in the uniqueness of their numbers and by employing video scanning apparatus in conjunction with optical character recognition (OCR) software and broadcasting capabilities so it can recognize the currency's value from a digitized serial number, store it with or without "tag", by memory means and be able to transmit and receive additional lists as a part of a network and as an extension; to recognize foreign countries currency, bank checks, personal checks and bills to be paid, for example: telephone bills, utility bills, etc.



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INTELLIGENT CURRENCY VALIDATION NETWORK

Since the creation of paper money, the "war" against counterfeit assigned to very able persons an very capable service departments with all the latest state of the art technology and facilities in their disposal, with result to cease the counterfeiting to a large percent, especially from its amateur and unorganized counterfeiters.

Although is not possible to have detailed statistics in the subject concerning counterfeiting and especially in cases of very good quality "fake money" which can pass mostly undetected, plus the fact that the technology was always in the side of the perpetrators, supply them with the latest equipment such as scanners, color laser printers and image processing through PCs.

This unfair "war" becomes worse if we assume that the counterfeit can be done by "organized" perpetrators such as extreme (but not impossible) that the perpetrators is an enemy county that desires to damage the economy of their enemy or even more bazaar (but also not impossible) the country itself in an economical desperation decide to print money with same serial numbers. Obviously these scenarios are very difficult to follow because especially in the second case the control of the currency printing is made by many honest men with integrity and several departments which are staffed with able men. But in every case they remain "men".

On the other hand even we maliciously suppose that the above scenario had been done, nobody ever will be able to prove the counterfeiting was existed because the bills were "authentic" and "perfect" that because the "organized" perpetrators had used the same paper, the same printing device, the same ink and technology.

More than that it is obvious that no government is ever possible to admit the counterfeit with the consequence of seeing their economy collapsed.

They're in not a thing that the organized counterfeiters can not do, except of course from inventing new serial numbers.

They are always forced to use the same serial numbers several times.

The proposed method is based upon a very simple principal, that paper money always carries a "name" that is its serial number, which the technology used so far did not had the ability to exploit it. The proposed invention recognizes money's name so it brings money out of its "anonymity".

The present invention can work with other existing systems and can be worked in conjunction with currency counting devices,(in which we can add a special printer which can print the numbers of the currency in the securing tape of the bundle so the cashier cannot replace the money with the fake ones, something which could be done in the past) Drawerless cash registers (DCR), with automatic tellers (ATM), a local currency to Euro exchange machines, with machines excepting utility bills (UBPM), pay bill machines and money/check/credit vending machines (VM), which is, itself, an extension of my Video Vending Machine, already patented under number 4,858,749 on August 22, 1989 in USA. And other machines and devices as we reveal next.

The main component of the system consists of an image recognition system such as but not exclusively, a Couple Charge Device (CCD) similar to ones readily found in the markets known as "scanners" for transferring pictures and images to a personal computer (PC). This "scanner" can also employ Optical Character Recognition (OCR) software, which specifically recognizes the currency's denomination and can screen the currency by denomination numbers. It also can recognize and store digitally the serial number of the currency. Also, the software can have an element (ICON) which depicts the entire surface of the paper currency which can be either both sides or select portions of the paper currency and since the "scanner's" software has the ability to magnify the image in very small specific details which can be compared to identify information in the existing currency which is virtually unseen by the naked eye.

Such details are well known to government bodies and agencies issuing currencies around the world.

The optical character recognition software of the system can be used to compare denomination numbers, serial numbers, left and right series numbers, printing numbers, issuing bank numbers, date of printing, treasury and secretary signatures, or any other number, letter or icon, which gone help to verify the authenticity of the currency. We can also add an electronic ID (TAG) in every passing bill which can identify the country, the time, the special place which the transaction occur, and every other information that the authorities will find appropriate and useful such as if this specific bill was a part of a bigger amount or it is passed alone.

This system also employs ultra-violet light to detect ink color and paper quality and with the appropriate back lighting can recognize hydrographics. Also with the use of a magnetometer we can detected metallic lines (wires) imbedded between the paper layers and from its magnetic properties to discern between a metallic element and an ink line usually used by unsophisticated counterfeiters. We also can read magnetic inks.

The ability of the system and its software to digitize and recognize serial numbers give this approach the most intelligent use, since the serial numbers of the currency can be compared in the system's memory with an existing list, supplied by the country's treasury or appropriate department, of available serial numbers for that particular denomination and/or issuing date. So the system can determine the denomination by existence of that serial number on the supplied list.

The system can compare the under-investigation currency with a list of serial numbers representing stolen numbers, fraudulently obtained numbers, serial numbers used by special agencies, for example narcotic agencies, to trace the path of currency recipients from the result of a "sting" or surveillance activity, a list of destroyed money by the treasury department due to age,

being voided or canceled, or other reasons and determine if those moneys "avoid" the distraction.

It is obvious to those in the art that many scenarios of information can be created, in which instruct machine's operators to undertake one scheduled action or the system could make an action automatically, for example to automatically point a hidden camera to photograph the person dispersing the money and especially when it concerns for an automatically banking machine (ATM) to prompt the patron to push a specific button behind of it, it has been installed one special camera so that it record one part of the patron's fingerprint and to go forward to other activities that have been pre-programmed.

The information about the numbers could be given into the system whether by hardware means, e.g. ROM, PROM, EPROM or with any other magnetic or optical mean for example hard disk, soft disk, CDROM.

The lists could be transferred by-directionally through a modem and a telephone line or cable TV, satellite communication, radio, Network P/C or any another communication system that will be chosen, present or future one.

The system with the ability to store locally the number of scanned currency in optical, magnetic or any other means existing or use it in the future and if the system is installed in a bank or a super market or any other money dealing establishment, the numbers from all the incoming bills will be store and can be transmitted through the communication link to the proper authority in a predetermine time or in case of an unlawful action (such as a robbery) the numbers of the bills transmitted to the central processing authority which can be transmit the above numbers of the bills to the rest of the notes of the network such as a "black" list so the notes can take an action according to the program.

That way the stolen money rented "unusefull" to perpetrators, because they can be identified and that they can be lead to their apprehension.

It is obvious to those in the art that the connection from and to the Central processing unit has to be protected by some means of cryptographic skims available in the market or one similar to the one I describe in great details in my US patents (APPARATUS AND METHOD FOR REMOTE SENSOR MONITORING, METERING AND CONTROL.) No.4.241.237 Dec. 23 1980 and No. 4.455.453 Jan. 19 1984.

Furthermore with the use of the 'black' lists the society can be benefit financially and socially. This could impose difficulties to the drug distribution, the money laundry from drugs and the blackmails. Also it could help the prevention of the tax evasion.

The installation of the network can be sapped as a 'Pyramid', in this way the top of the Pyramid is the Central Bank with the control services of counterfeiting, which can compare up all the numbers regularly for duplicate

numbers and compare them in order to find double numbers. This central service is connected with a lower level which can be the banks of its particular country in Europe if the system installed in the European Union.

These E. U. central banks take their information from the other bank's branches, which function in their countries.

The central banks of each country could get contact immediately or through the branches with the units that exchange money, like Public Funds, Booking Office. Post Offices, Airports, Department Stores, casino, entertainment centers and generally anywhere seen appropriate.

The birth of EURO is an ideal timing to create an establish a system such as proposed one and that because a huge number of cash registers have to be changed. That gives the opportunity to business to choose cash registers with the proposed system retrofitted to.

The participating country members have a lot to gain from the system since from one hand it will minimize the losses from the counterfeiting and as a by product will be imposed great difficulties in the drug trafficking money, money laundry, robberies. Blackmails tax evasion etc.

On the other hand the system will create job positions for the operators of the system and for the manufacturing and maintenance.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1.

Is a typical diagram of the main components connected as a network of the system.

Figure 2.

Is an overall block diagram of an exemplary embodiment of this invention.

Figure 3.

Is an exemplary embodiment of a memory's allocation structure.

Figure 4.

Is an exemplary embodiment of logic flow diagram for the system's software.

Figure 5.

Is an exemplary embodiment of block diagram of a typical system.

Figure 6.

Is a conceptual illustration of a Drawerless Cash Register.

Figure 7.

Is a conceptual illustration of a Local Currency to Euro Exchange Machine.

Figure 8.

Is a conceptual illustration of a Video Fingerprinting System.

Figure 9.

Is a conceptual illustration of a proposed video screen scenario.

DETAILED DESCRIPTION OF DRAWINGS

Figure 1: It shows a typical network that validates the authenticity of the

paper-money consisted of several Typical Store Arrangements (1) which are connected with a mobile or dial-up telephone line as a network with a Typical Central Unit (2).

Each Typical Store Arrangement (1) in this exemplary embodiment consist from one P/C (3) which have a resident LAN Card (4) which connected with a twisted pair or coaxial(5) wires with the reading an authenticating currency devices (6) which are connected with a money collecting devices such as cash registers (7).

The devices (6) carry internally, the video cameras (10) and the currency input (8). The system depend of its use, can be connected with one or more Euro to Local Currency Exchange Machines (9). The CPU (3) connected internally or externally with a MODEM (15) which is connected with a telephone line or with any other mean which we have choose to connect the system with a Central Office/Processing Unit (2).

The Central Office/Processing Unit (2) consist of a communication HUB SERVER (12) which connected with central CPU (13) and with a printer. The HUB server (12) connected through the telephone network with the higher level Centers (14) which in their turns connected to the higher level Central Office/Processing Units or even the pick of the Pyramid.

A typical operation of the system is: The cashier of the store no matter what that is a bank or a super market or anything else, receive the money from the patron and place in the money input (8) so they can be "read" the serial numbers of the currency. The digitized numbers through the lines (5), and the LAN card (4) stored in the memory (24) of the CPU (3).

If the client self served (9) the same procedure will be followed so the CPU(3) will stole the currencies serial numbers.

In a pre- determinate time intervals the CPU (3) will be communicate with the local HUB SERVER (12) and will sent all the store numbers. If during the operation the CPU (3) discover the same number more than ones which one of them is probable in the cashiers hands and the other is perhaps in the memory, the system will trigger the proper program and according to that will be record the picture of patron and will sent instructions to the cashier and the rest of the authorized personal. Next will save the picture of the patron along with other data (see figure 9) and will transmit the data to the Central Office/Processing Unit (2) for further action.

Something similar will be happen if the CPU (3) determine the under investigation number belong to a "list" which can be stolen money, money from drug traffic etc.

In a case of arm robbery the cashier will be force to surrender the money to the perpetrator, soon after the perpetrator leaves the CPU (3) will transmit all the numbers of the stolen money to HUB SERVER (12). The HUB SERVER (12) will transmit in all the CPUs in his sprockets and all the Central

Office/Processing Unit (14) of higher level the numbers of the stolen currency in a form of a "black list" so when the currency appears, the system will record the picture of the user and follow the appropriate action plan. The same procedure will be follow if the money come from a "sting" operation such as narcotics sorveilans so they appears in a "red list" and the employees will be follow the appropriate programs.

Figure 2. Illustrates an overall block diagram of an exemplary embodiment of the system. At the left site shows the customer interfaces means which can be but no limit to: a CRT monitor (16) for the operator, a loudspeaker (17), a microphone (18), a video camera (10) a keyboard (19) and a printer (20) for hard copies of receipts.

It shows also the more common communications links such as: telephone line (11), cable TV (21), AM-FM radio-satellite reception antenna (22). Many other existing bi-directional communications links can be used or even same future ones.

The input/output devices are connected bi-directionally with the intelligent currency validators and other applicable devices such as:

- 1) Drawerless Cash Register(25).
- 2) Utility bill pay machine (UBPM) (26) in which the patron insert in appropriate entrance slot the bill to be paid. The system recognize the bill and the amount to be pay and instruct the patron to insert the paper currency in the proper money entrance and then after determine the authenticity of the currency to stab the bill as a "paid".
- 3) Cash Gambling Machines (CGM) (27) which can be retrofitted to the exiting machines dispensing LOTTO, PROTO, XISTO, Pick Five etc, and sell any other lottery tickets desire.
- 4) Vending Machines (VM) (28). Such as machine rending video tapes like the one which I invent and for that reason I develop the present system.
- 5) Cash Dependent Businesses (29). Casinos, banks savings and loans and any other business which can handle large amount of money will be benefit from the installation of the proposed system which not only protect them from counterfeit losses but from arm robberies too.
- 6) Local Currency to Euro Exchange Machine.(9). In which the patrons will be exchange the local currency to a new Euro, in the operation will explain later.

Figure 3. In this exemplary embodiment of a memory's allocation structure the system's memory can be typically arrange in the appeared fashion and that means in one position of the memory, (address) will be place the beginning of the issuing serial numbers and in other position (address) the end of the issuing numbers. In an other address we can place the face value of its currency e.g. 5 EURO. The same logic will follow for the 10,20,100 etc EURO or any other participating currency.

Between the beginning and the end of each issuing lot will can be place all the numbers which is unacceptable e.g. numbers which cancelled due to overused, destroyed or belong to a certain "lists". That way we limited the use

of the available memory as much as possible, obviously we can use any commercial memory surpressing software available in the market.

Figure 4. An exemplary embodiment of a typical logic flow diagram is presented in figure 4. In this script the system initially will remain in a standby condition (30). When the entrance sensor (31) triggered, give order to start the paper money entrance motor(33).As soon as the currency pass under the scanner (32) instruct the reading of the currency (33). When the reading is over (34) compare the number with that in memory (35) and if the number's parameters exists (36) go forward to find the number in a potential 'black' list (37) and if it is not in the list then compare the currency's denomination value (38) and put the number of the paper money and it's value in the suitable memory (39) and goes back in a standby (30) state.

If something doesn't go right like the number of the paper money is in a 'list' then raise a 'flag'(40) and goes back in the start point (30).

The same will happen in case that the number isn't in the memory (41) or find a difference to the numbers (42) or anything other problem appear to the program it will trigger the suitable subroutine to take the proper action.

Figure 5. Shows a conceptual illustration of an exemplary embodiment of a typical block diagram of an intelligent currency validator system in which the currency (43) is appropriately placed by the operator into the currency input, consisting of a retainer plate (46) and a spring (45) loaded pressure plate (44). Upon the detection of the presence of the currency through the appropriate sensors the intake wheel (47) moves the first bill of the stuck currency (43) to the appropriate rollers (49) assisted by the belt system (50). The counter-direction ruffle cylinder (54) acts as a deterrent of the second bill to be inserted into the mechanism, allowing only the top bill of the stack to go through the optical scanner (48) which contains its own light source. The image (picture) from optical scanner (48) is transferred to the CPU (3). The CPU (3) upon processing the image with the help of the OCR program in memory (24) can compare the serial number from the scanner to the available serial numbers of memory (55). Upon successful comparison the CPU (3) issues a command to store that successful transaction into the memory(55),until transfer by the communication link to a Central Office/Processing Unit.

Figure 6. Is a conceptual illustration a drawerless cash register (25) application. More specifically, the currency entry ports in the DCR will allow the cashier to place a stack of currency (56) and (57) in the system according to their denomination.The currency advanced forward by the robber wheels(58) and (59) and force to pass under the magnetic sensor (60), the optical scanner (48) and the ultra-violet tube (61). As soon as the currency prove authentic the system put them in the money stuck (62) and (63) according the their denomination. It is obviously the system has more than two money stocks and

as many as necessary but for the simplicity if the present description we have forfeited. The system also has a provision to return the change to the customer (64), (65) in a such a way that the cashier do not have to open and close draws and the machine manage the money automatically and safely.

5 During the authentication procedure and as soon as the money verify the systems store their serial numbers otherwise return it to the exit (66) as unacceptable.

10 In the procedure of returning the change to the patron the system returns the first receiving money in a fashion (FIFO) first in first out. That way the system knows every time what money comes in and what goes out for added security in case of the money remove by force or illegally.

Obviously the system can employ a backlight bulb (67) to read the hydrographic in the currency.

15 Figure 7. Is a conceptual illustration of an exemplary embodiment of a typical Local Currency to Euro Exchange Machine. The left site appears the customer interface which consists from a video camera (10), loud speaker (17), CRT (16) a keyboard (19), microphone (18), output of reseal priding mechanisms (20) and a special key for the fingerprint reception (68).

20 In the face of this conceptual embodiment we have convenient place the money entrance (70), the money exit (80) and the port receiving EURO (86) which is also the port receiving the euro coins (92).

As soon as the patron press the start button (68) the CPU instruct him through the display (16) and the loud speaker for the further steps. The patron will place his local currency in the entrance (70) and through the wheel (71) they will advance and passing under the magnetic sensor (60), the optical scanner (48), the U/V tube (61), the hydrografs tube (67) and if they approve authentic as we explain earlier the wheel (72) forward the currency do the wheels (73) and (78) will store the local currency in the storing stocks (77) and (79) accordingly. In the mean time the CPU has instruct the solenoid (74) through the perforating tool (75) to open a hole in the local currency to rendered them useless. The discarded piece of the currency will be collected from the collection bucket (76).

35 It is obvious that the perforation if the currency can be of a different shape for each machine so can be recognize easily.

The remain currency can be stored in lower security environment until their destroy totally or keep for any other use.

40 The unaccepted currency will be returned to the patron through the port (80) alone with instructions through the display (16) and the speaker (17). If something goes wrong with the patron's currency the system will be record the picture of the patron and ask him to press the button (68) which this time will be trigger the switch (95) (figure 8) to start the video camera (96) to record a part of his fingerprint. This fingerprint will be incorporated in the video screen (98) (figure 9).

As a part of the Programme the system will also ask the customer if he prefer the return of the none authenticated currency now, or he can provide additional information through the keyboard (19) so the system can credit his account as soon as the manual authentication take place.

5 The data provided by the patron through the keyboard (99) will be appears in the screen (98) alone with the data provided automatically by the system (figure 9).

10 All the data which appears in figure 9 will be stored and transmitted accordingly. If the patron provide the wrong data or flee the scene, this will perhaps indicating his guilt and the system will follow a Program notarize the proper authorities.

15 It is obvious to those in the art the programs which we employee can be more or less rigid, that means the video camera (10) can be analyze the picture and determine if the print is from a human figure or the patron wear a glove, also can analyze and determine if the face of the patron is life or is covered by same means.

20 After the authentication, perforation and storage of the local currency the system will dispense the appropriate amount of euro from the stuck (81) and (82) through the robber wheels (83) and (84) will advance the money in to the belt (85) which will forward the currency into the exit(86).

25 Obviously the system can and will incorporate the coin stocks (87) which with the help of the coin dispensing motor (88) will dispense the coins,for each full tern of the motor's (88) axle (89) the bracket (90) will be dispense through the slut (91) a single coin, which trip in the belt (85) and then in the position (92) ready for the patron to collected.

It is obvious for simplification reasons only we have minimize the storage places and denominations available.

Figure 8. Shows a conceptual illustration of an exemplary embodiment of a typical Video Fingerprinting System.

30 The push button (98) is constructed by a transparent material shaped as a magnify lens in his center.The puse button (68) turning around his axle (93) and illuminated by the light source (94).With the press of the button the switch (95) close and trigger the logic of the system which put in operation the digital camera (96).

35 It is obvious many other procedures, schemes and mechanisms we can employee for the recording of the fingerprint but we choice this only for his simplicity in this example.

40 Figure 9. It is a conceptual illustration of a video screen which contains the picture of the patron (98) the picture of his fingerprint and certain data provided by the system such as time location etc and from the data which can voluntarily provided by the client.

This screen can be stored in a memory if some reason appears, or can be discarded if the program decide to, so can save transmission time and memory.

Obviously if the authorities deem appropriate the picture can be stored and analyzed for statistical purposes such as to find out how many man or woman use the machine what is the ages and the prefer time of operation etc.

- 5 It is obvious to those in the art that the mentioned programs, mechanisms and scenarios of this description is choice only for their simplicity and many other available can be employ according to the needs of the application and of course the system can work as a "stand alone" or can be retrofitted to the existed or future developed systems.

What is claimed is:

1. A method to recognize the authenticity of the paper money based on the uniqueness of their serial numbers and other elements that specialize this recognition by using picture optical scanning means, digitization of the picture, compare with similar picture in the memory and by using a software program for optical character recognition (OCR). And with bi-directional communication means to establish data exchangeing network.
2. A method as in claim 1 that the system can get connected through mobile phones in a network and as an extension with the Internet.
3. A method as in claim 1 that can get an emergency contact with the other parts of the network to exchange data in a real time frame.
4. A method as in claim 1 that has a central system collecting information, which can get connected with scheduled, or not, time intervals with the notes of the base to exchange data information for processing or to exchange data and 'lists' of the wanted currency numbers.
5. A method as in claim 1 that can add, store compare and transmit an electronic identification number (TAG) in every serial number of the currency which can deal with.
6. A currency validation apparatus which can scan, investigate, authenticate and verify paper currency by means of picture scanner means of memory storage digitizing means comparison of icons and serial number means alone with telecommunication means so they can work independently or as a part of a network.
7. A currency validation apparatus as in claim 6 which with the help of optical scanner means able to transfer the icon of the currency in digitize form and store in a computer memory means and with the ability to compare lattes and numbers from memory means and store the result in memory.
8. A currency validation apparatus as in claim 6 which with the appropriate light means can identify and read hydrographic icons and digitize them and compare with icons stored in memory.
9. A currency validation apparatus as in claim 6 which employees means to transmit and receive ultraviolet light (UV) and with the logic analysis program can analyze and process the results.
10. A currency validation apparatus as in claim 6 in conjunction with mechanical means entrance and exit paper currency can be used as a currency exchanger .
11. A currency validation apparatus as in claim 6 in conjunction with the cutting, slicing and perforating means can cut or slice or perforate paper currency so can render them worthless.

12. A currency validation apparatus as in claim 6 with currency counting means currency expectance means and currency storage means alone with the ability to receive and dispense change so can be used as a drawless cash register.
- 5 13. A currency validation apparatus as in claim 6 with a currency counting means and with a printing of the serial numbers means to print them in security tape of currency's bundle.
- 10 14. A currency validation apparatus as in claim 6 with appropriate logic program means to read and recognize utility bills and with logic means to recognize bills to be paid and with means to do so.
15. A currency validation apparatus as in claim 6 that has means for receiving, digitizing, comparing, and processing the fingerprint and photographs of its operators.

INTELLIGENT CURRENCY VALIDATION NETWORK

by T. G. PARASKEVAKOS

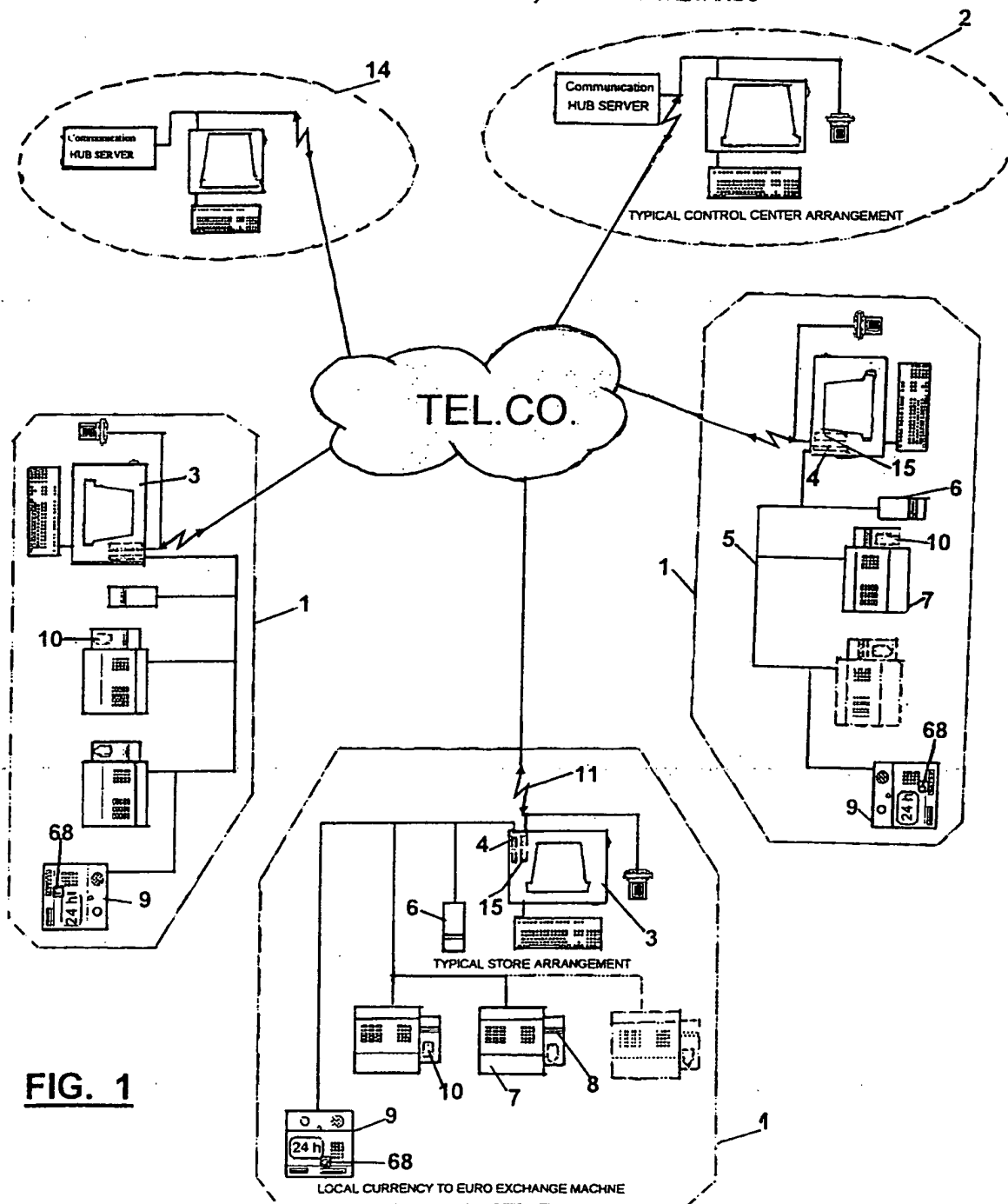
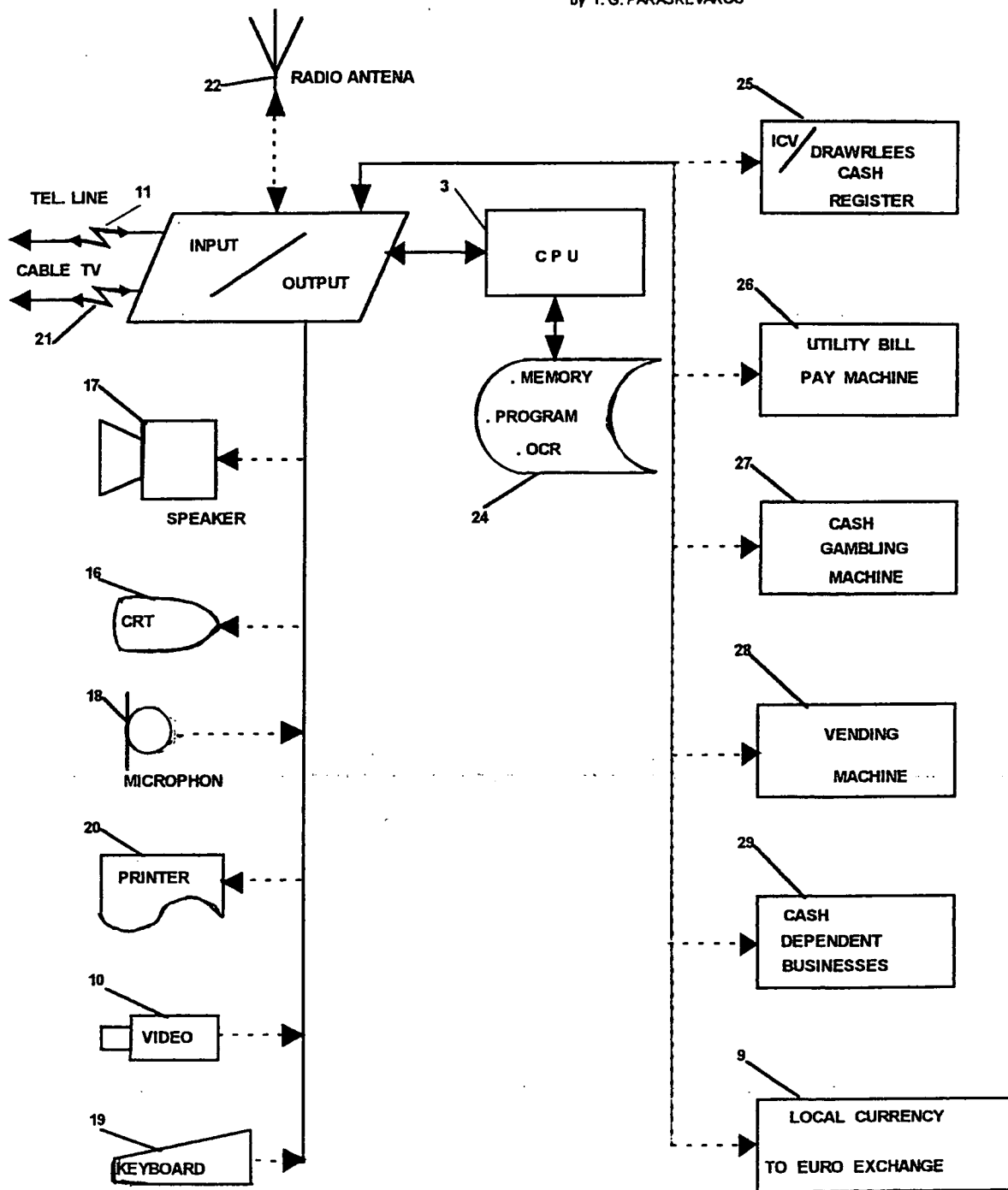


FIG. 1

INTELLIGENT CURRENCY VALIDATION NETWORK

by T. G. PARASKEVAKOS

**FIG. 2**

INTELLIGENT CURRENCY VALIDATION NETWORK

by T. G. PARASKEVAKOS

MEMORY	
E 0000001 TO E 6003500	= 5 \$ OR €
<hr/>	
S 1001000 TO S 5000100	= 10 \$ OR €
<hr/>	
F 700200 TO F 900000	= 10 \$ OR €
<hr/>	
F 900001 TO F 9999999	= 20 \$ OR €
<hr/>	
ABC 0000000 TO ABC 9999999	= 50 \$ OR €

FIG. 3

SUBSTITUTE SHEET (RULE 26)

INTELLIGENT CURRENCY VALIDATION NETWORK

by T. G. PARASKEVAKOS

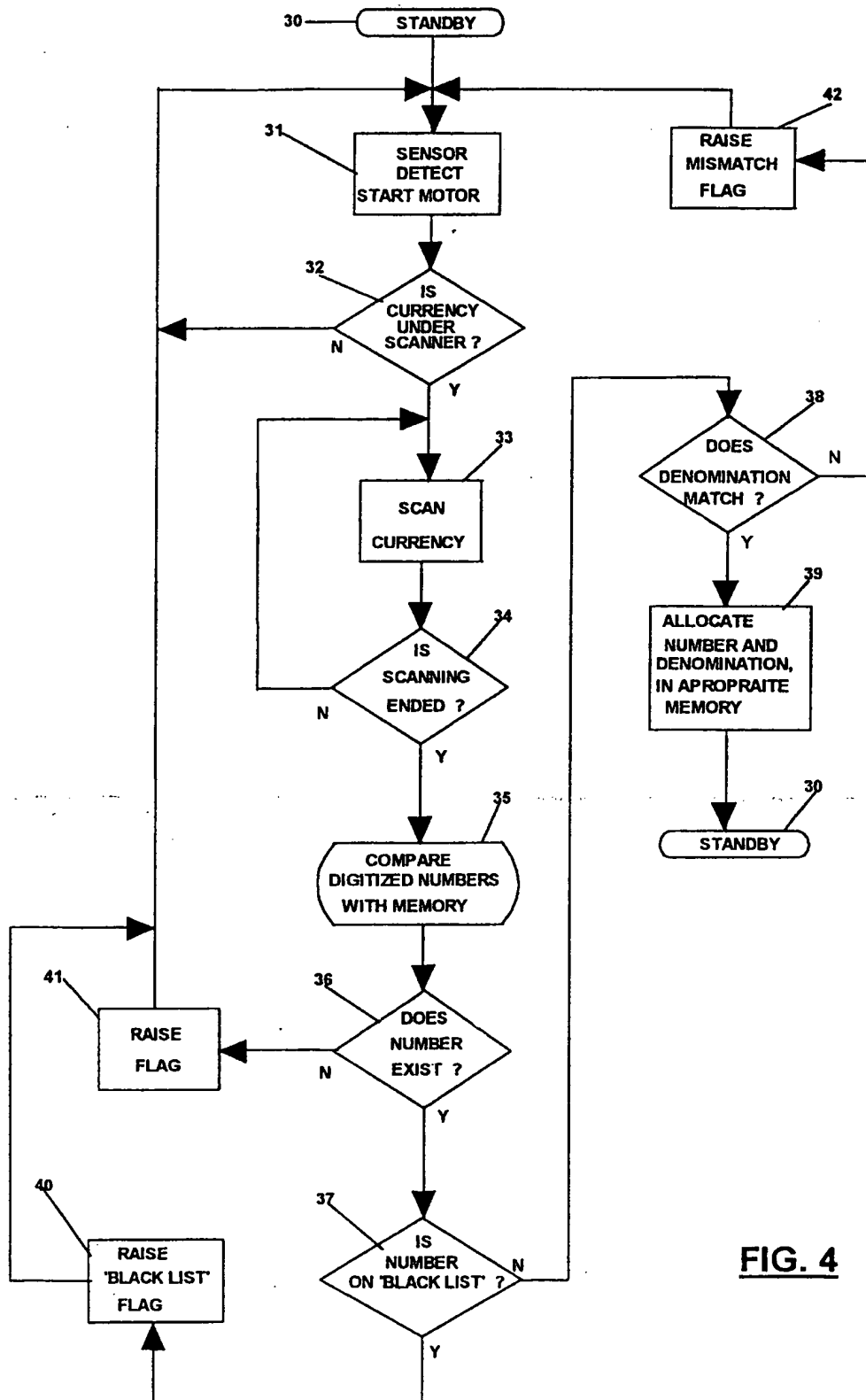


FIG. 4

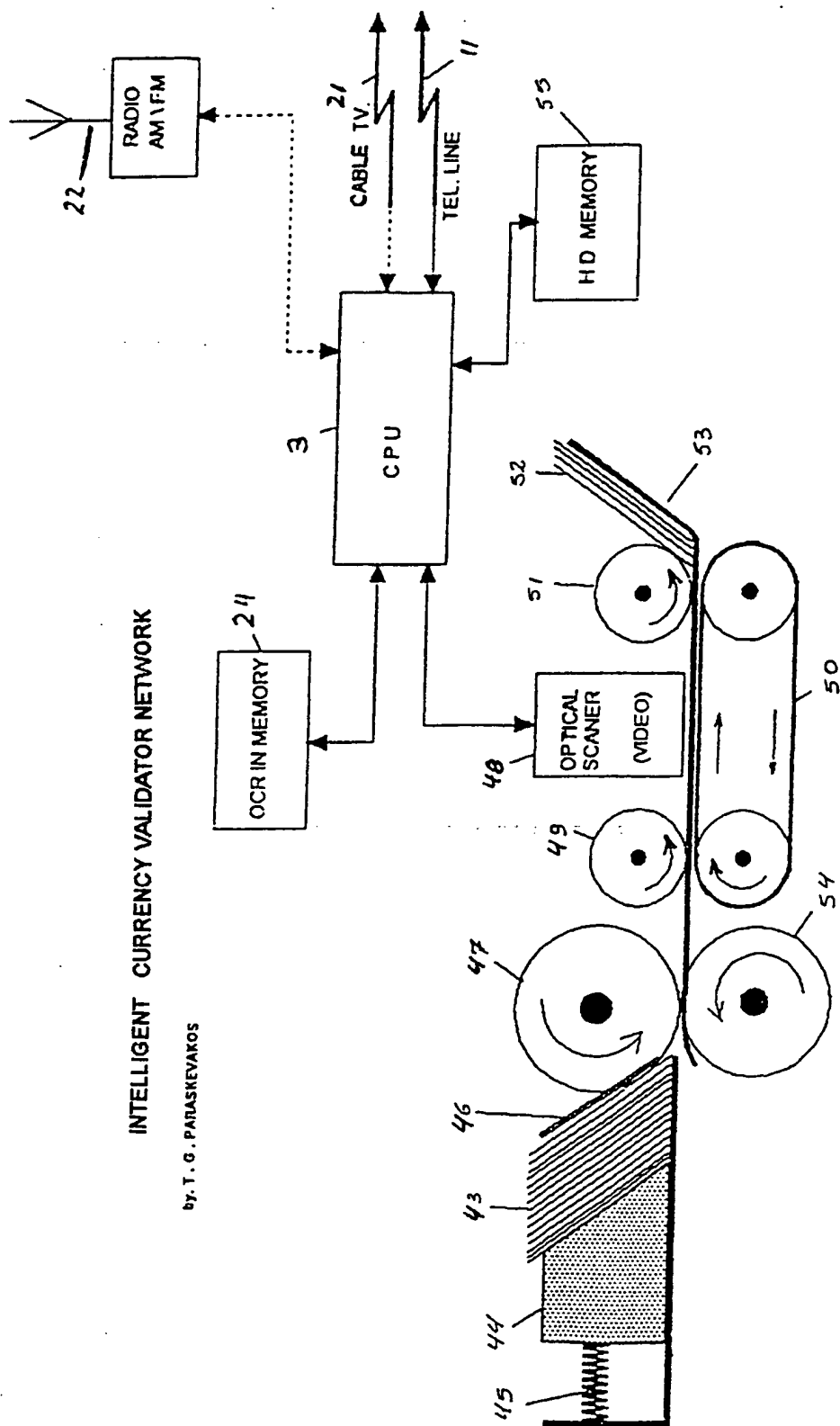


FIG. 5

INTELLIGENT CURRENCY VALIDATOR NETWORK

by T. G. PARASKEVAKOS

INTELLIGENT CURRENCY VALIDATOR NETWORK

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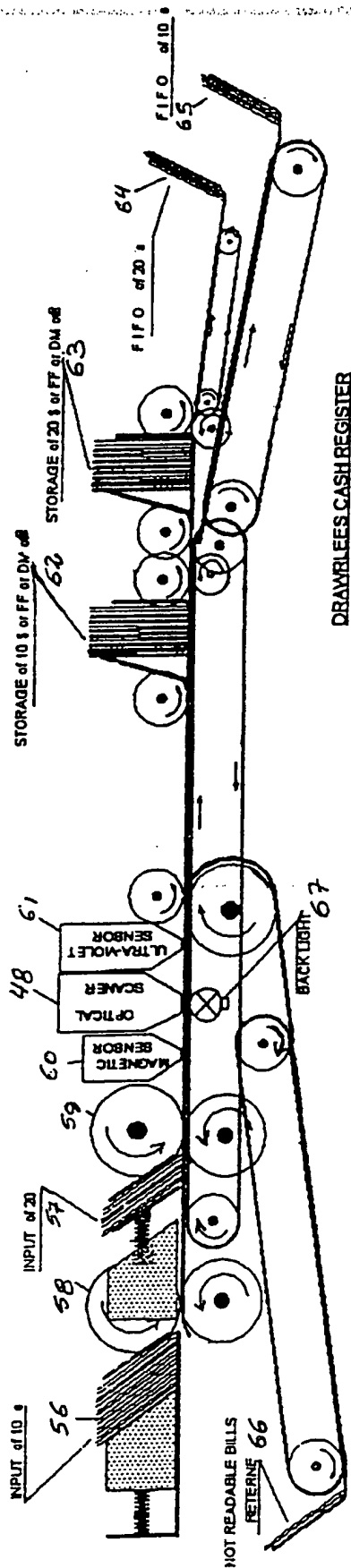


FIG. 6

INTELLIGENT CURRENCY VALIDATOR NETWORK

By T. G. PARASKEVAKOS

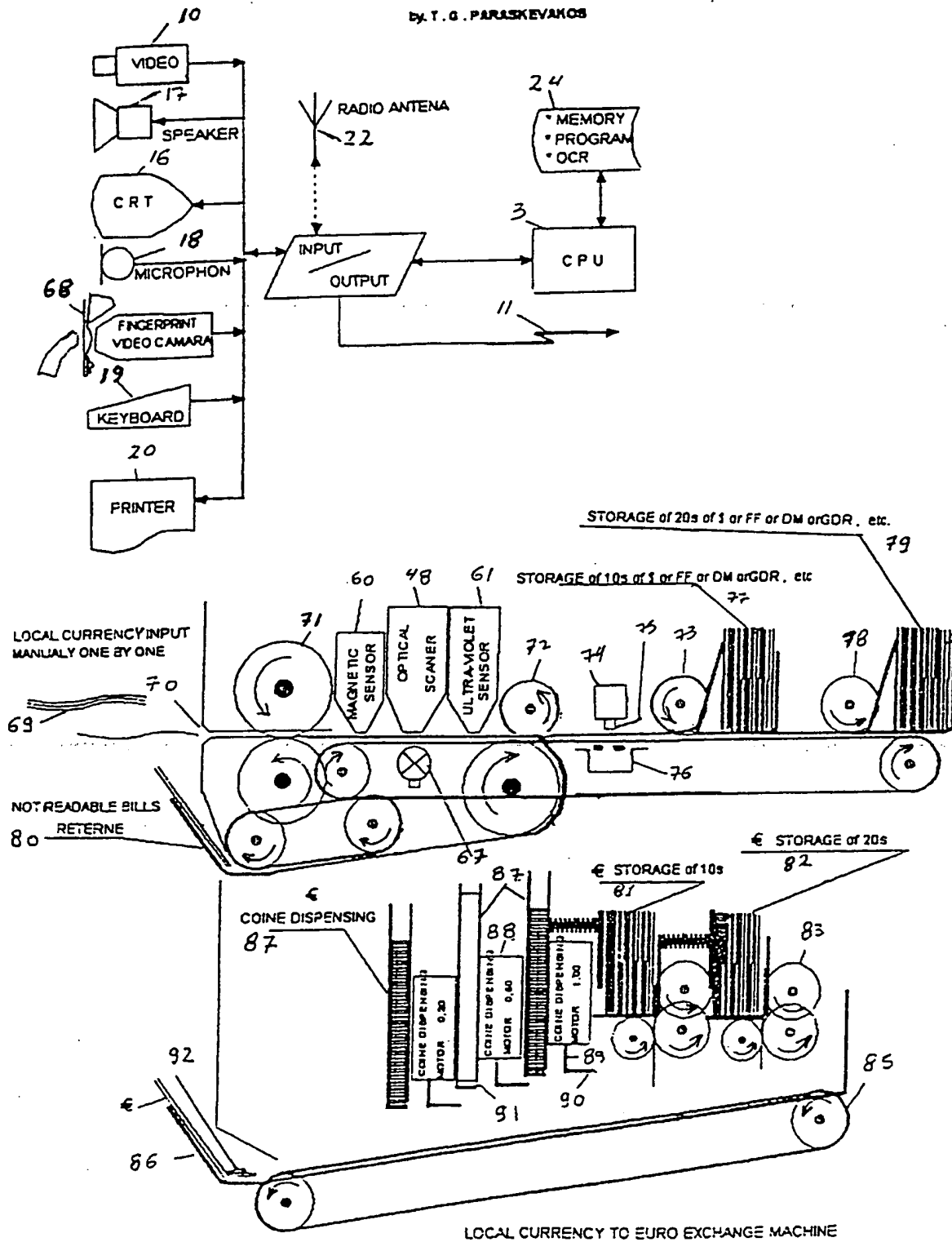


FIG. 7

SUBSTITUTE SHEET (RULE 26)

INTELLIGENT CURRENCY VALIDATOR NETWORK

by T. G. PARASKEVAKOS

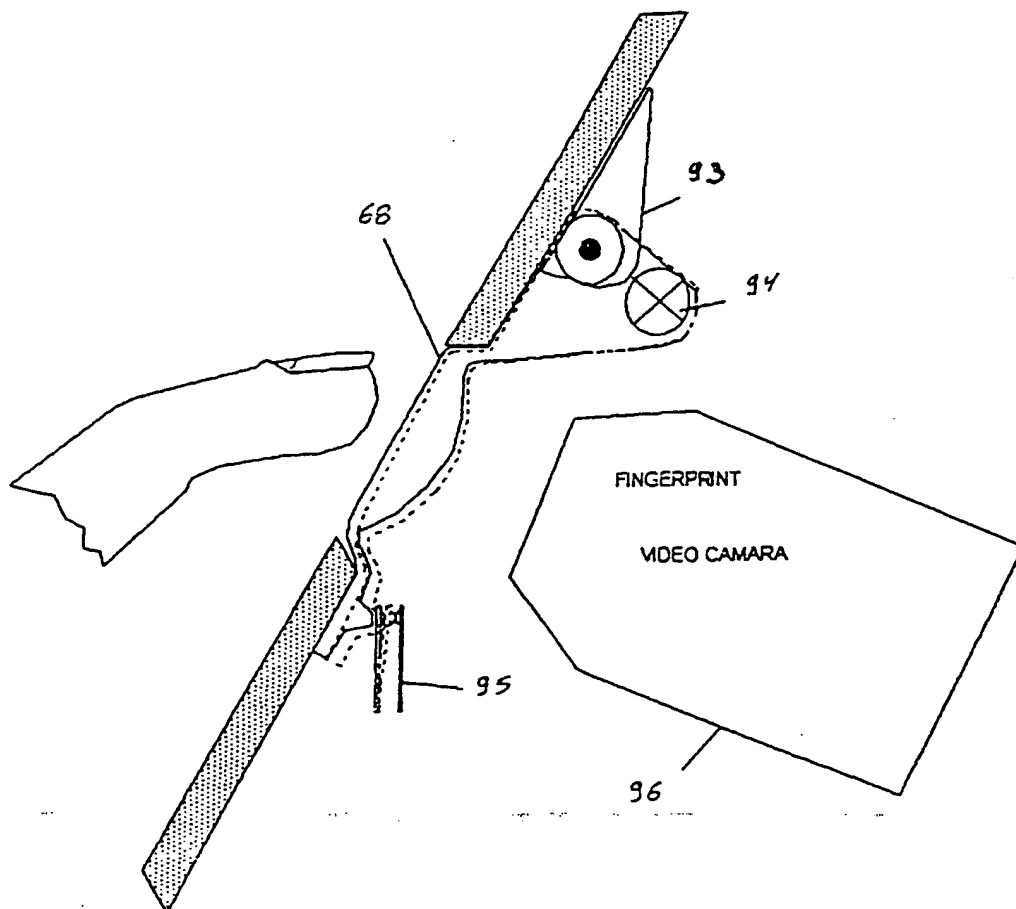
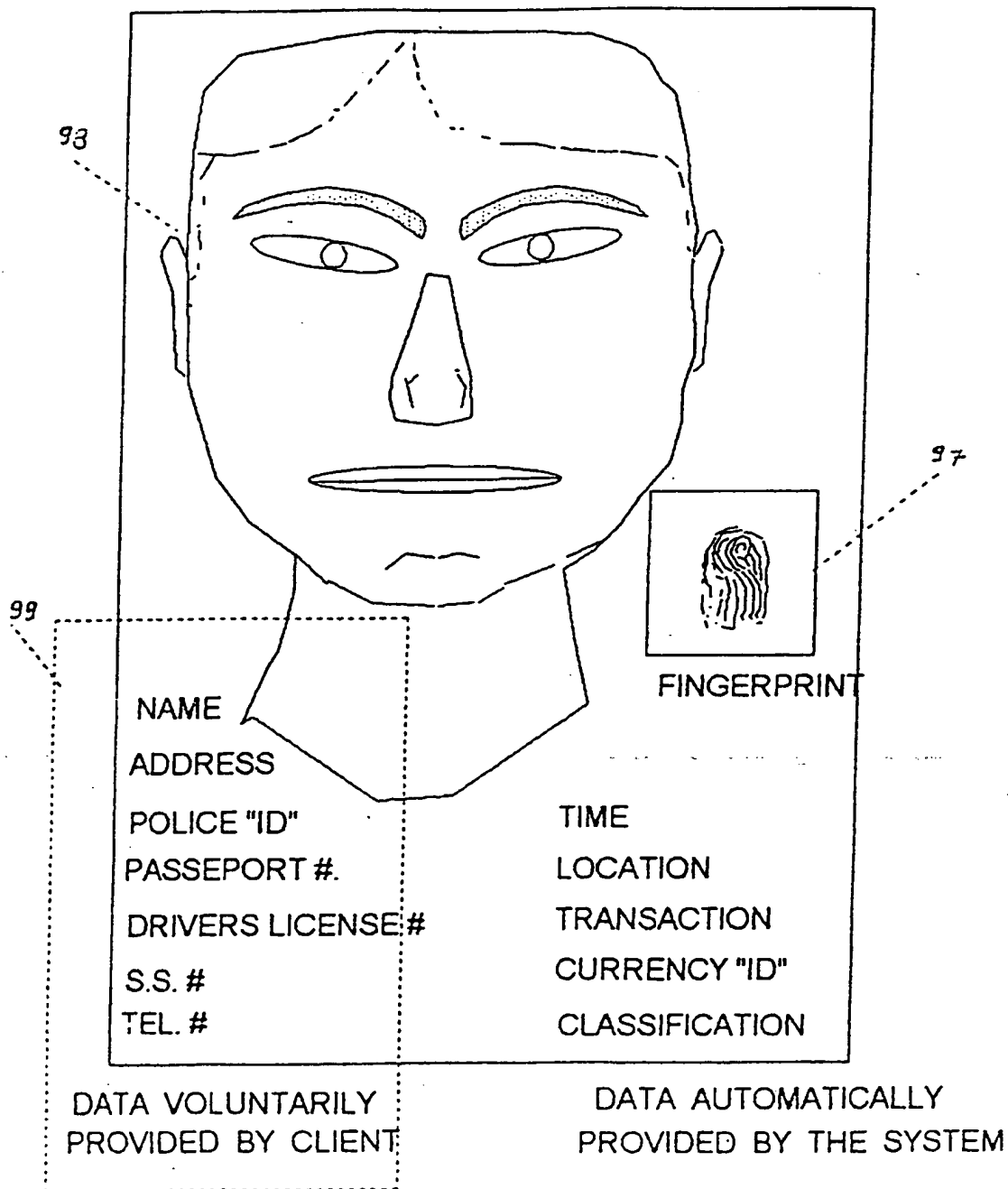


FIG. 8

INTELLIGENT CURRENCY VALIDATOR NETWORK

by T. G. PARASKEVAKOS

**FIG. 9**

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INTERNATIONAL SEARCH REPORT

Inter nal Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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